AIRCRAFT DOOR ARRANGEMENT

TECHNICAL FIELD

[0001] The present invention relates to an aircraft door arrangement, especially for an airplane and, in turn, especially for an airplane with a pressurized cabin.

STATE OF THE ART

[0002] From various types of aircraft that have been in operation for a long time, an aircraft door arrangement is known that comprises a door, a door frame and a support arm 102, as depicted in Figure 5. This support arm 102 has a pivoting axis AD on the door side, on which the door is mounted so as to swivel, and it has a pivoting axis AF on the frame side, on which the support arm 102 is mounted so as to swivel on the door frame. The pivoting axis AD on the door side is defined by two articulated joints G1, G2 positioned at a distance from each other in the vertical direction Y of the support arm, each articulated joint comprising two bifurcated bearings L1a, L1b, L2a, L2b which are positioned at a distance from each other in the vertical direction Y and which are each formed by two eye plates. The door arrangement has a pivoting drive 104 that serves to swivel the door. This pivoting drive 104 is configured as a linear actuator arranged laterally on the support arm 102, said actuator extending essentially over the entire width of the support arm 102. The left-hand side of the actuator 104 in the drawing is attached to the support arm 102 while its right-hand side is attached to a moveable driven element 106. This driven element 106, in turn, is coupled to the door and transmits an actuating movement of the actuator 104 to the door. As can be seen in the drawing, this mode of construction calls for a separate bearing arrangement 108 for the driven element 106, an intermediate lever 110 and numerous other components, an approach that has a detrimental effect on the overall weight of the door structure. Moreover, due to the linear actuator 104, which is installed laterally, the support arm 102 has to have a considerable overall depth. Furthermore, this gives rise to long load paths. Due to the described mode of construction, the support arm 102 is also subject to a relatively high load stemming from the reaction forces of the actuator 104. Consequently, the occurring forces

have to be absorbed by component areas that are dimensioned to be correspondingly stronger which, in turn, increases the weight. This prior-art door arrangement is quite complex and costly.

[0003] The applicant's not previously published document DE 10207033 discloses an aircraft door arrangement for an airplane as shown in Figure 6. According to the generic part of Claim 1, this aircraft door arrangement comprises the following: a door 2; a door structure 4; a door frame 6; a support arm 8 with a pivoting axis AD on the door side, on which the door 2 is mounted so as to swivel, and a pivoting axis AF on the frame side, on which the support arm 8 is mounted so as to swivel on the door frame 6, whereby at least the pivoting axis AD on the door side is defined by two articulated joints G1, G2 positioned at a distance from each other in the vertical direction Y of the support arm 8, whereby at least one of said articulated joints comprises two bearings positioned at a distance from each other in the vertical direction Y (see, in particular, Figure 7); a pivoting drive 10 that is arranged in the area of the support arm 8 on the door side and that serves to swivel the door 2; and a driven element 12 that is coupled to the pivoting drive 10 and to the door 2 and that transmits an actuating movement of the pivoting drive 10 to the door 2. On the side of the support arm 8, the driven element 12 encompasses a universal joint 14 arranged in the area of the upper articulated joint G1 on the door side and an upper triangular arm 16 attached thereto and extending all the way to the door 2. A universal joint and a lower triangular arm 18 are likewise provided on the lower articulated joint G2 on the door side. The latter two parts, however, are not driven.

[0004] In the locked state, the door is locked by means of locking elements in the door frame 6 and it is laterally supported by means of radial, that is to say, lateral, contact mountings 20 that serve to provide the lateral guidance and that are present on the door 2 as well as on the door frame 6.

[0005] When the door 2 is opened and closed, a kinematic door system determines the movements of the door 2 that occur relative to the door frame structure or to the fuselage of the aircraft. In a door arrangement according to DE 10207033, two drive lines, which are uncoupled from each other, namely, a kinematic lifting system and a kinematic swiveling system, are normally provided in the kinematic door system.

[0006] The kinematic lifting system is needed during the opening phase of the door 2 in order to lift the door 2 and to separate the radial contact mountings 20 from each other. Said system also comprises several shafts 22 which can be actuated manually, for example, by a hand lever. The turning of the shafts 22 causes a relative movement between the support arm 8 and the triangular arms 16, 18 to be generated by the parallelogram consisting of the "door 2 – upper triangular arm 16 – support arm 8 – lower triangular arm 18 – door 2", said movement ensuring that the door 2 is lifted. During the lifting process, the door 2 is guided in a defined manner in so-called guiding plates 24 on the fuselage side. During a closing phase of the door 2, the kinematic lifting system functions analogously in the opposite direction as a kinematic lowering system. The kinematic swiveling system has the task of swiveling the door 2 to the side after it has been lifted. The kinematic swiveling system is actuated via the pivoting drive 10 (here, an electric actuator). The door 2 is swiveled open by means of the parallelogram consisting of the "door 2 – triangular arms 16, 18 – support arm 8 – door frame structure 6 – control arm 26 – door 2" and it starts when the actuator 10 initiates a torque onto the support arm 8. During a closing phase of the door 2, the door 2 is swiveled closed analogously in the opposite direction.

[0007] Figure 7, which shows a third, not previously published state of the art, is an enlarged view of a partial area of a support arm 8 in the area of an upper articulated joint G1 on the door side. The support arm 8 is structured in a similar manner to the support arm of Figure 6. Clearly visible in Figure 7 are the two bearings L1a, L1b which are positioned at a distance from each other in the vertical direction and which are formed by two eye plates that create a bifurcated hinge connection. The driven element 12 (here, a universal joint 14 with the upper triangular arm 16) is arranged between the two eye plates. A load-transmission means 28 of the pivoting drive (not shown here) engages below the articulated joint G1. This load-transmission means 28 is axially and non-rotatably connected via a shaft 30 to a pivot pin 32 of the universal joint 14 that serves as a hinge pin. As can be seen in the drawing, the load-transmission means 28 or its shaft 30 has to be mounted on and held by at least one additional bearing Lx in addition to the bearing L1b, which it also utilizes. In view of the large number of bearings L1a, L1b, Lx needed and the height of the space required for the load-transmission means 28 or its shaft 30, this causes the support arm 8 to have a great overall height and results in a complex arrangement of the pivoting

drive, so that numerous attachment points are needed for the pivoting drive. Moreover, this likewise makes assembly and disassembly of the pivoting drive more difficult. Furthermore, with such an arrangement, it is very difficult or impossible to compensate for alignment flaws of the pivoting drive and other components that lie in the vicinity of the load or torque transmission path of the pivoting drive, in other words, separate balancing devices have to be installed. This not only results in a complex structure, but also in an increased weight of the door construction and has a detrimental effect on both the function and the service life of the pivoting drive.

[0008] Moreover, aircraft door arrangements generally entail the problem that the doors are subject to high stress caused by external loads such as, for instance, wind loads, blocking of the door and the like. These external loads exert particular stress on the bearings of the support arm on the door side, they deform the support arm and give rise to considerable stresses, distortion and bending of the pivoting drive, especially of its driven member, which likewise has a detrimental effect on the function and service life of the pivoting drive. In case of damage or wear and tear of the door attachment elements, of the support arm or of the bearings of the pivoting drive in prior-art aircraft door arrangements, it is hardly possible to repair the support arm. As a consequence, it is usually necessary to replace the entire support arm, which increases the repair or maintenance costs.

PRESENTATION OF THE INVENTION

[0009] The invention is based on the objective or technical problem of creating a simple and effective aircraft door arrangement that avoids, to the greatest extent possible, the above-mentioned drawbacks associated with the state of the art.

[0010] This objective is achieved with a door arrangement having the features of Claim 1.

[0011] The aircraft door arrangement according to the invention, especially for an airplane, comprises the following: a door; a door frame; a support arm with a pivoting axis on the door side, on which the door is mounted so as to swivel, and a pivoting axis on the frame side, on which the support arm is mounted so as to swivel on the door frame, whereby at least the

pivoting axis on the door side is defined by two articulated joints positioned at a distance from each other in the vertical direction of the support arm, whereby at least one of said articulated joints has two bearings positioned at a distance from each other; a pivoting drive that is arranged in the area of the support arm on the door side and that serves to swivel the door; and a driven element that is coupled to the pivoting drive and to the door and that transmits an actuating movement of the pivoting drive to the door. The aircraft door arrangement according to the invention is characterized in that one of the two bearings of at least one of the articulated joints on the frame side (or else of both articulated joints) is configured as a pivoting drive mounting to which the pivoting drive is attached.

[0012] In other words, one bearing has been replaced by the pivoting drive mounting. The articulated joint in question is now formed by the pivoting drive mounting (or by the components attached to this mounting) and by the other bearing of this articulated joint. As a result, the pivoting drive can only be attached and mounted on bearings in one single place, namely, on the pivoting drive mounting, and consequently it can be installed in the immediate vicinity of an articulated joint and of the driven element. This translates into short and clear-cut load paths or load flows. Therefore, the pivoting drive mounting, which concurrently effectuates the bearing and attachment of the pivoting drive, mechanically introduces the reaction forces of the pivoting drive that occur during operation into the support arm in a very favorable manner.

[0013] Moreover, a simple, detachable attachment of the pivoting drive to the pivoting drive mounting (for example, by means of fitting pins, fitting bolts and the like) is possible. The direct attachment or suspension of the pivoting drive on the pivoting drive mounting – which, in a manner of speaking, is a bearing itself and is thus in the immediate vicinity of an articulated joint site – also allows a simple and effective alignment of the pivoting drive and thus a simple compensation for alignment flaws without additional, complex and heavy balancing devices. The pivoting drive, especially its driven member, can be aligned or centered directly on the pivoting drive mounting.

[0014] As a result of incorporating the pivoting drive in the immediate vicinity of an articulated joint or of a bearing of this articulated joint, no distortion or bending of the pivoting

drive or of its driven member occurs when the door and the bearings of the support arm on the door side are subjected to an external load. Rather, when the support arm or the bearings are deformed, the pivoting drive can follow these movements load-free due to the fact that it is directly coupled or connected to the pivoting drive mounting. This makes a major contribution to improving the function and service life of the pivoting drive and thus to greater operating safety of the entire aircraft door arrangement.

[0015] Owing to the replacement of one bearing of the particular articulated joint by the pivoting drive mounting, which itself or whose components assume a bearing function, and owing to the direct connection of the pivoting drive to this mounting, the overall space required for this part of the kinematic door system can be reduced or the space present in a support arm construction, especially the available height, can be better utilized and can serve for the integration of the pivoting drive into the support arm structure. In comparison to prior-art door arrangements, in which the pivoting drive extends laterally on the support arm, the door arrangement according to the invention can be constructed so as to be much narrower or thinner. As can be seen, for example, in a comparison with Figure 7, in the case of the solution according to the invention, it is possible to dispense with the additional bearings that have been needed so far for the separate load-transmission means of a conventional pivoting drive.

[0016] Reducing the required space also allows excellent accessibility to the pivoting drive. If necessary, the pivoting drive can be easily detached from or attached to the pivoting drive mounting, which renders the assembly and disassembly work quick and easy. In this context, there is no need to disassemble the entire door. In case of damage or wear and tear of the attachment or bearing of the pivoting drive, the ease with which the pivoting drive mounting can be replaced means that it is likewise not necessary to replace the entire support arm. On the contrary, in many cases, it will be sufficient to merely replace the pivoting drive mounting. This is also advantageous when it comes to repairing the support arm. In this manner, maintenance and repair work can be simplified and costs for repair and maintenance can be cut.

[0017] Furthermore, in comparison to conventional constructions, the aircraft door arrangement according to the invention also drastically reduces the number of components

needed for the door opening and closing functions which, in turn, lowers the weight and contributes to a lightweight construction.

[0018] The above-mentioned advantages are made possible particularly by the pivoting drive mounting, by its special arrangement and by its multiple functions.

[0019] Other preferred and advantageous embodiment features of the aircraft door arrangement according to the invention are the subject matter of the subordinate claims.

[0020] A preferred embodiment of the invention with additional configuration details and other advantages will be described and explained in greater depth below with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The following is shown:

[0022] Figure 1 – a schematic perspective view of an essential component, that is to say, a support arm, of an aircraft door arrangement according to the invention;

[0023] Figure 2 – an enlarged, perspective detailed view of the right-hand, upper area of the image from Figure 1;

[0024] Figure 3 – a schematic sectional view along the line III-III of Figure 1 for purposes of illustrating a first articulated joint variant of a support arm realized with a pivoting drive mounting;

[0025] Figure 4 – a sectional view analogous to Figure 3 for purposes of illustrating a second articulated joint variant of a support arm realized with a pivoting drive mounting;

[0026] Figure 5 – a schematic perspective view of an aircraft door arrangement according to a first state of the art;

[0027] Figure 6 – a schematic perspective view of an aircraft door arrangement according to a second, not previously published state of the art, and

[0028] Figure 7 – a support arm of an aircraft door arrangement according to a third, not previously published state of the art.

PRESENTATION OF A PREFERRED EMBODIMENT

[0029] For purposes of avoiding duplications in the description that follows as well as in the figures, parts and components that are the same will be designated with the same reference numerals insofar as no further differentiation is necessary.

[0030] An aircraft door arrangement according to the invention (here, for an airplane with a pressurized cabin), in the present embodiment, like in the state of the art according to Figure 6 (corresponding reference numerals are employed), comprises an airplane door 2 designed as a passenger door, with a door structure 4 and a door frame 6 that is formed by a frame structure of the fuselage. Moreover, the door arrangement comprises a support arm 8 that is preferably made of fiber composite material (for instance, carbon fiber reinforced plastic – CRP), of an aluminum alloy or of another suitable material or material combination. The support arm 8 has a pivoting axis AD on the door side, on which the door 2 is mounted so as to swivel laterally, while it has a pivoting axis AF on the frame side, on which the support arm 8 is mounted so as to swivel on the door frame 6. In an area of the support arm 8 on the door side, there is a pivoting drive 10 that serves to swivel the door 2. In the present case, this pivoting drive 10 is an electromechanical rotary actuator. The invention, however, is not restricted exclusively to this type of pivoting drive. Depending on the application case, other suitable pivoting drives such as, for example, hydraulic or pneumatic actuators, can also be used.

[0031] Figure 1 shows a schematic perspective view of an essential component, that is to say, the support arm 8 of an aircraft door arrangement according to the invention equipped with the pivoting drive 10. As can be seen in this drawing, the pivoting axis AF of the support arm 8 on the frame side, that is to say, the pivoting axis AF belonging to the door frame, is defined by two bifurcated articulated joints G3, G4 positioned at a distance from each other in the vertical direction Y of the support arm 8. Each articulated joint G3, G4 has two bearings L3a, L3b, L4a, L4b that are positioned at a distance from each other in the vertical direction Y. Each of these bearings L3a, L3b, L4a, L4b is formed by an eye plate.

[0032] The pivoting axis AD of the support arm 8 on the door side, that is to say, the pivoting axis AD belonging to the door 2, is defined by two articulated joints G1, G2 positioned at a distance from each other in the vertical direction Y of the support arm 8. The lower articulated joint G2 is designed similarly to the articulated joints G3 and G4, in other words, it is bifurcated and has two bearings L2a, L2b at a distance from each other in the vertical direction Y, which are each formed by an eye plate.

[0033] In contrast, the upper articulated joint G1 likewise has two bearings at a distance from each other in the vertical direction Y, but this articulated joint construction is designed fundamentally differently from the articulated joints G2, G3 and G4. To be more precise, one (here, L1B) of the two bearings L1a, L1B of the upper articulated joint G1 on the frame side is configured as a pivoting drive mounting 34 to which the pivoting drive 10 is attached. As can be seen in Figure 1, the pivoting drive mounting 34 (or else components or areas thereof) – relative to vertical direction Y of the support arm – now forms the lower bearing L1B of the upper articulated joint (G1) of the two articulated joints G1, G2 on the door side.

[0034] It should be mentioned at this juncture that, depending on the design and positioning of the support arm 10 and on the requisite arrangement of the pivoting drive 10, the pivoting drive mounting 34 – relative to vertical direction Y of the support arm 8 – can, of course, also form the upper bearing L2a of the lower articulated joint (G2) of the two articulated joints G1, G2.

[0035] Moreover, as set forth in the invention, a construction can be realized, for example, with two pivoting drives, in which there are two pivoting drive mountings, namely, one on articulated joint G1 and the other on articulated joint G2, according to the arrangement described in the last and next-to-last paragraphs.

[0036] The pivoting drive mounting 34 is preferably designed as an integral component (made, for instance, of aluminum alloy or titanium alloy, fiber composite material or the like) although, as a matter of principle, it can also be configured as a differential part. If the pivoting drive mounting 34 is positioned sufficiently precisely on the support arm 8, then said mounting can already be prepared or completely pre-assembled or else it can be reworked once it has been installed, that is to say, on the support arm 8, in order to achieve a precise alignment and positioning of the pivoting drive 10.

[0037] Figure 2, which is an enlarged, perspective detailed view of the right-hand, upper area of the image from Figure 1, shows additional details of the door arrangement according to the invention in the area of the articulated joint G1 of the support arm 8. In this example, the pivoting drive mounting 34 is configured as a separate part and it has a support arm attachment section 36 which, in this case, is designed so as to be bifurcated or claw-like and it also grasps two sides on the free edge of the support arm 8. Here, the inner surfaces of the bifurcated areas of the support arm attachment section 36 form contact surfaces that lie against the corresponding side surfaces of the support arm 8. The pivoting drive mounting 34 is detachably affixed to the support arm 8 by means of suitable attachment means 38. These attachment means 38 are screw bolts, fitting bolts and the like.

[0038] Moreover, the pivoting drive mounting 34 has a plate-like pivoting drive attachment section 40 (hereinafter referred to as baseplate 40) extending essentially vertically (and thus approximately in an X-Z plane) with respect to the pivoting axis AD on the door side, whereby said baseplate 40 has a passage opening 42 and can be connected to a front section or flange 44 of the pivoting drive 10. Express mention is hereby made of the fact that the invention is not restricted to this concrete embodiment of the pivoting drive attachment section 40. It goes without saying that the pivoting drive attachment section 40 can also be designed or shaped

differently so as to be adapted to the particular type of pivoting drive used and to its adapter means. As can be seen in Figure 2, the baseplate 40 laterally makes a transition to the support arm attachment section 36 or ends in the appertaining bifurcated areas of the support arm attachment section 36.

[0039] Above the baseplate 40 and at a distance thereto, the pivoting drive mounting 34 has a bearing section 46 (hereinafter referred to as bearing plate 46) with a bore and at least one bearing element 48 arranged in this bore (see Figure 3), thus forming the bearing L1B of the articulated joint G1. According to the depiction in Figure 2, the bearing plate 46 makes a transition to the support arm attachment section 36 on the left-hand side. Moreover, the bearing plate 46 is connected to the baseplate 40 by means of several ribs 50. The mode of construction described above essentially achieves lightweight construction and thus a low weight of the pivoting drive mounting 34. As a matter of principle, however, the pivoting drive mounting 34 can also be configured, for instance, with uninterrupted material transitions leading from the baseplate 40 to the bearing plate 46 and to the support arm attachment section 36 and the like, for example, in the form of a continuous connecting wall between the above-mentioned elements. Other, more massive modes of construction are likewise conceivable.

[0040] It can also be seen in Figure 2 that the pivoting drive 10, via its front flange 44, is placed on the baseplate 40 from below and attached to said baseplate 40 in a detachable manner by means of attachment means 52 such as, for example, a screw-in connection or fitting pins and/or fitting bolts and the like. Here, an upper flange surface of the pivoting drive 10 is in contact with a lower contact surface of the baseplate 40. The contact reaction that occurs during operation due to the driving torque of the pivoting drive 10 is introduced in a positive manner into the pivoting drive mounting 34 via the attachment means 52 (or parts thereof), said mounting 34 then transmitting these forces to the support arm 8. However, a force transmission from the pivoting drive 10 to the pivoting drive mounting 34 can fundamentally also be achieved in a non-positive manner.

[0041] With the door arrangement according to the invention as shown in this embodiment, the pivoting drive 10 is arranged in the pivoting axis AD on the door side and between the two

articulated joints G1 and G2. In this context, the pivoting axis AD on the door side runs right through the pivoting drive 10. Moreover, the pivoting drive 10 is arranged so as to be centered relative to the pivoting axis AD on the door side, so that the driven axis of the pivoting drive 10 is flush with the pivoting axis AD of the support arm 8 on the door side. The pivoting drive 10 or its driven axis can be aligned in a precisely flush manner in the mounted state of the pivoting drive 10, for example, by changing the position of the pivoting drive mounting 34 on the side of the support arm attachment section 36. Once in a suitable position, the support arm attachment section 36 can then be securely connected to the support arm 8. For this purpose, appropriate adjustment means can be provided on the support arm attachment section 36, on the support arm 8 itself or on the attachment means 38. If, in contrast, the support arm attachment section 36 is already attached in its final position on the support arm 8, then the position of the pivoting drive 10 can be adjusted and secured, for instance, by means of the baseplate 40 and/or the flange 44. Appropriate adjustment means can be provided here as well.

[0042] As can be seen especially clearly in Figures 1 and 2, between the upper bearing L1a and the pivoting drive mounting 34, a driven element 12 engages the support arm 8 and its pivoting drive 10. This driven element 12, which is directly or indirectly coupled on one side to the pivoting drive 10 and on the other side to the door 2, transmits the actuating or rotating movement of the pivoting drive 10 to the door. On the side of the support arm 8, the driven element 12 encompasses, for example, a universal joint 14 and an upper arm attached thereto, particularly an upper triangular arm 16, which extends all the way to the door. A corresponding universal joint as well as a lower arm or triangular arm are also to be found, although in a non-driven embodiment, on the lower articulated joint G2 of the support arm 8 on the door side.

[0043] Figure 3, which depicts a schematic sectional view along the line III-III of Figure 1, shows further details of this construction for purposes of illustrating a first articulated joint variant realized with a pivoting drive mounting 34. For the sake of clarity, the ribs 50 are not shown in Figure 3.

[0044] As indicated in Figure 3, the pivoting drive 10 has a hollow driven shaft 54 into which a bearing pin or hinge pin 56 engages non-rotatably with a first lower pin area. The hinge

pin 56 extends flush with the pivoting axis AD on the door side all the way through the first bearing L1a and into the pivoting drive mounting 34 and through its bearing plate 46 and bearing element 48 into the hollow driven shaft 54. In a first upper area, the hinge pin 56 is non-rotatably connected to the universal joint 14 (as part of the driven element 12), as a result of which the transmission of force and torque from the pivoting drive 10 to the door is ensured. In a second lower area, that is to say, above the hollow driven shaft 54, the hinge pin 56 is mounted radially in the bearing element 48 of the bearing plate 46 and, in a second upper area, in other words, above the universal joint 14, it is mounted radially in the eye plate of the bearing L1a. An axial safety mechanism is advantageously provided for the hinge pin 56.

[0045] This mode of construction allows a particularly simple and effective assembly and disassembly of the pivoting drive 10. As is evident from the drawing, after the connection (attachment means 38) to the baseplate 40 has been detached, in order to be completely disassembled, the pivoting drive 10 only has to be pulled downwards for a short distance that actually corresponds to the length HW of the hollow driven shaft 54 that protrudes over the front of the flange 44. As a result, the requisite height H (H > HW) of the free space beneath the pivoting drive 10 is very small, which is an extremely advantageous aspect.

[0046] Figure 4 shows a sectional view analogous to Figure 3 for purposes of illustrating a second articulated joint variant of the support arm 8 realized with the pivoting drive mounting 34. This embodiment dispenses with the bearing plate 46 and with the bearing element 48 of the pivoting drive mounting 34 of Figure 3. Instead, the hinge pin 56 engages directly into the hollow driven shaft 54 via a radial centering fitting 58 and said hinge pin 56 rests radially on said driven shaft 54. Moreover, for the transmission of the torque, the hinge pin rests tangentially via its outer teeth on corresponding inner teeth of the hollow driven shaft 54. As indicated in the drawing, for example, a radial bearing 60 of the pivoting drive 10 itself can take over the function of the second bearing L1B of the articulated joint G1.

[0047] Additional embodiment features of the door arrangement according to the invention can be configured, for instance, as shown and described in conjunction with the prior-art door arrangement depicted in Figure 6.

[0048] The invention is not restricted to the above-mentioned embodiment, which serves only to provide a general explanation of the core idea of the invention. Rather, within the framework of the protective scope, the aircraft door arrangement according to the invention can assume numerous embodiments other than the concrete one described above. Even though, in the above-mentioned embodiment, the pivoting drive mounting is configured as a separate part, the pivoting drive mounting can fundamentally also be configured integrally with the swiveling arm. It is also possible for the driven axis of the pivoting drive to run laterally to the hinge axis of the support arm on the door side. This is the case, for example, when the driven axis is not connected directly to the bearing pin or to the driven element but rather via at least another driving member that is inserted laterally.

[0049] The function of the hinge pin described in the embodiment above, which is non-rotatably connected to the driven element, can also be taken over by a driven shaft of the pivoting drive. Therefore, when it comes to the articulated joint of the support arm on which the pivoting drive mounting is provided, the driven shaft of the pivoting drive/actuator is part of the articulated joint mechanism and defines a partial section of the pivoting axis AD on the door side. The articulated joints (or parts thereof) of the support arm do not necessarily have to be bifurcated or have a design involving an eye plate. Particularly the articulated joints G2, G3 and G4 can be realized through other suitable articulated joint or bearing means such as, for instance, ball-and-socket joints, hinges, linkage rods and the like as well as by mixed forms thereof.

[0050] The embodiment and arrangement according to the invention of the pivoting drive mounting can also be employed on the articulated joints of the pivoting axis of the support arm on the frame side if the pivoting drive is arranged on the pivoting axis on the frame side. Moreover, based on the principle according to the invention, aircraft door arrangements can be realized in which the door does not swivel to the side but rather, for instance, upwards or downwards, for example, around a horizontal axis, in the manner of a gull-wing door.

[0051] The reference numerals in the claims, in the description and in the drawings serve merely for purposes of better elucidation of the invention and should not be construed as limiting the scope of protection.